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Indiana Land Surveys, Their Development and Uses

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Land surveys are used to precisely define locations and boundaries of tracts of land. They provide the stable foundation on which our nation's system of private land ownership is based.

Hoosier citizens benefit from two excellent land survey systems--the United States Rectangular Survey System and the Indiana State Plane Coordinate System. This publication reviews briefly the history and development of each, how it works and its particular value. Examples are provided on how to locate and describe property using the Rectangular System. Also noted are those lands not included in the original state survey and reasons why they weren't.

UNITED STATES RECTANGULAR SURVEY SYSTEM

History of Use in Indiana

The U.S. Rectangular Survey System originated with Thomas Jefferson, who was inspired by a concept the Romans used on a smaller scale to distribute land to military veterans. He wanted a more accurate, uniform method for recording land location and ownership in the Northwest Territory than that used in the original Colonies. Although initially it too had flaws, Jefferson's system over time evolved into this nation's standard land survey method.

The earliest survey work done in Indiana using Jefferson's ideas was in a wedge-shaped area formed by a treaty boundary on the west, the Ohio-Indiana border on the east and the Ohio River on the south (see Figure 1). This land was the first in the state to be laid out in townships, sections, and quarter-sections.

The Greenville Treaty Line, surveyed by Israel Ludlow in 1797, was the western boundary of territory ceded to the

United States by various Indian tribes. In Indiana, it runs south-southwest from a point 10 miles northwest of Greenville, OH (near Union City in Randolph Co., IN) to the junction of the Ohio and Kentucky rivers near Madison, IN. The boundary between Dearborn and Ripley counties is on this line.

Soon after the Greenville Treaty, a boundary was also established between Ohio and Indiana-the meridian line running north from the junction of the Miami and Ohio rivers (later called the First Principal Meridian).

Surveying of the remainder of Indiana, which began in 1803, was not without problems. Colonel Jared Mansfield, who later became our nation's second Surveyor General, eventually corrected the flaws and provided the framework for the current system.

The state survey was completed about 1834. In the process, the surveyors took notes that vividly described the physiography and vegetation, location of settlements and Indian villages, and problems encountered.

Elements of the United States Rectangular Survey System

The U.S. Rectangular Survey System established lines tracing north-south and east~west that permitted locating parcels of land in a uniform descriptive manner.

Principal meridians and parallel lines. The north-south lines were surveyed by astronomic (`true') north on the earth's surface rather than by magnetic north, which changes with time. The controlling north-south line for an area is called a `principal meridian'. Principal meridians are located throughout the continental U.S. with exception of the 13 original states, Vermont, Maine, Tennessee, West Virginia, Texas and parts of Kentucky and Ohio.

There are two such controlling lines in Indiana (see Figure 1). The First Principal Meridian, on the Indiana-Ohio border, was used to survey the wedge of land that had been part of the Greenville Treaty. The Second Principal Meridian runs through the center of the state at 86 degrees, 27 minutes, 21 seconds (86° 27' 21") longitude. This meridian was used in surveying the remainder of Indiana's land. Drawn at 6-mile intervals to these principal meridians were `parallel north-south lines.'

Figure 1. Location in Indiana of: (a) the Greenville Treaty Line; (b) components of the U.S. Rectangular Survey System, including principal meridians, base lines, initial point and correction lines; and (c) non-survey areas.

Base lines and cardinal lines. In order to define a location, a controlling east-west reference line is also needed. In the U.S. Rectangular Survey System, this line is called the `base line'. Two base lines were established in Indiana--one being the Ohio River; the other running through Knox, Gibson, Pike, Dubois, Greene, Washington and Clark counties (see Figure 1). `Cardinal east-west lines' were surveyed every 6 miles north and south of the base line.

Initial points. Where a principal meridian and a base line cross is called an `initial point'. The intersection of the First Principal Meridian and its base line is along the Ohio River. In their first efforts, surveyors reset the base line to the Ohio River every 6 miles. This moving base line was very confusing and not used again.

The intersection of the Second Principal Meridian and its base line is south of Paoli (Orange Co.) in the Hoosier National Forest (see Figure 1). This particular spot has been marked and set aside for visitors in recognition of the importance of the survey to Indiana's settlement and development.

Survey townships. The 36-square-mile area within a set of survey lines running parallel to a principal meridian and a set of cardinal lines parallel to a base line is referred to as a `survey township.' This is not to be confused with a civil township, which is a unit of government that may or may not coincide geographically with the survey township.

Each survey township is identified by its distance from both the principal meridian and the base line (see Figure 2). For instance, the first 6- mile segment north of the base line is designated `Township 1 North', or T1 N, the second is T2N, the third T3N, etc. Similarly, the 6-mile segments east and west of the principal meridian are called Range 1 East (R1E), Range 1 West (R1W), etc.

In identifying a specific survey township in the system, first the north-south block is listed, then the east-west block. For example, the shaded township in Figure 2 is T15N R3E, Second Principal Meridian. This particular township contains the state capital and downtown Indianapolis.

Now test yourself on survey township identification. Referring again to Figure 2, write the designation for blocks `A' and `B'. The answers are at the end of the figure caption.

Township A _____

Township B _____

Figure 2. Area in central Indiana enlarged to illustrate survey township identification scheme east and west of the 2nd Principal Meridian and at the correction line between T 16N and T 17N. (Township `A' is designated T18N R3W, 2nd Principal Meridian; Township `B' is T15N R2W, 2nd Principal Meridian.)

Sections and smaller. Each survey township, being approximately 36 square miles, is divided into 36 `sections', which are numbered as shown in Figure 3. While, theoretically, each section is 1 square mile and contains 640 acres, for a variety of reasons sections are rarely exactly that size. Adjustments in townships being more or less than 36 square miles are made in the northern and western tiers of sections (Sections 1, 2, 3, 4, 5, 6, 7, 18, 19, 30 and 31 in Figure 3).

Every section in the state has a unique designation based on section number and township identification. For example, the shaded area in Figure 3 is Section 10 T2N R3W, Second Principal Meridian.

To locate and identify particular parcels of land, a section is broken down into fractions that describe location and approximate area within that location. Figure 4 shows examples of this descriptive system. These fractions can be used in many different combinations to describe a property.

For instance, Parcel A in Figure 4 is called the Northwest 1/4 of Section 10 T2N R3W, Second Principal Meridian. Parcel B, which is 10 acres, would be described as the Southeast 1/4 of the Southeast 1/4 of the Southwest 1/4 of Section 10 T2N R3W, Second Principal Meridian (written SE1/4 of SE1/4 of SW1/4 of Sec. 10 T2N R3W).

Now you give the descriptions for parcels C, D and E. The answers are given in the figure caption.

Parcel C _____

Parcel D _____

Parcel E _____

The U.S. Rectangular Survey System did not accommodate the gridding of some small irregular areas, such as those found on the adjusted north and west sides of survey townships or those adjoining major rivers or large lakes. In these cases, the parcels are referred to as *lots*, and are noted as such in their descriptions.

Correction lines. During the initial survey of Indiana, Col. Mansfield and his coworkers found that occasional corrections were needed to keep the meridian lines from converging as the survey moved north from the base line and from diverging as it moved south. To solve this problem, four east-west `correction lines' were designated as the places where north-south township lines would be adjusted to restore their original 6-mile intervals.

Figure 1 locates these correction lines in the state: (1) between T31 N and T32N north of Fort Wayne (Allen Co.) east of the Second Principal Meridian; (2) between T28N and T29N south of Rensselaer (Jasper Co.) west of the Meridian;

(3) between T16N and T17N north of Indianapolis (Marion Co.) across the entire state; and (4) between T4S and T5S north of Evansville (Vanderburgh Co.) west of the Meridian.

Figure 3. Pattern followed for numbering the sections within a survey township (Detail of Section 10 shown in Figure 4).

Figure 4. Detail of Section 10 of T2N R3W in Figure 3 illustrating the fractioning system used to locate and describe specific parcels of land. (Parcel `C' is described as SW1/4 of SE1/4 of Sec. 10 T2N R3W, 2nd Principal Meridian; Parcel `D' is the S1/2 of NE1/4 of Sec. 10 T2N R3W, 2nd Principal Meridian; and Parcel `E' is the NW1/4 of SE1/4 of SW1/4 of Sec. 10 T2N R3W, 2nd Principal Meridian.)

These corrections are responsible for the `dog-legs' in the east and west boundaries of the counties through which the correction lines pass. (Note, for instance, the Marion-Hancock, Hancock-Henry, and Henry-Wayne county borders.) Figure 2 shows the correction near Indianapolis in more detail-i.e., at the survey township level (In a number of areas in Indiana, section lines are offset by other correction lines. They are recognized by the tight, radical jogs in county roads that happen to follow section lines. These offsets resulted from original survey techniques later improved, and do not denote major correction lines.).

In later surveys of other states, correction lines were simply placed every 24 miles, instead of at long, irregular intervals as was used in Indiana when the system was just being developed.

The five-point system. One application of the Rectangular Survey is to locate a specific place by the `five-point system.' This procedure gives a *general* location, such as is needed for a soil survey. The five points are the four corners and center of a section. The place in question is located by giving the distance from one of these points.

To illustrate, in Marshall Co., the typical location of Plainfield soil is 1100 feet west and 1400 feet north of the center of Section 30, T34N R1E. The typical Rensselaer soil is 1150 feet east and 380 feet north of the southwest corner of Section 9, T33N R4E. Note that in any location from a corner, all four cardinal directions will be mentioned (e.g., east, north and southwest).

Non-Survey Areas in Indiana

When the state survey was completed in 1834, some fairly sizable tracts of land had been excluded. What was not included and why is explained below; where these tracts are located is shown in Figure 1.

* The *Michigan Road Land Sections.* This land, containing 45 sections, was among that originally ceded to the U.S. Government by the Pottawottomi Indians as part of a treaty. The Government then gave it to the State of Indiana, which subsequently sold off the 45 sections to fund a Michigan City-to-Madison road building project.

The land sold begins just south of Lakeville on U.S. Hwy. 31 in St. Joseph Co., proceeds along U.S. 31 through Marshall and Fulton counties, and follows Ind. 25 out of Rochester, ending where Ind. 25 and Ind. 16 intersect in Cass Co. These sections were surveyed before the official state survey was complete, thus were not included.

* *The Indian Reserves.* There were 125 such reserves not ceded to the Federal Government. They are mostly along rivers in 1 5 counties from Warren Co. on the west to Allen and Jay counties on the east. Some are named for the owners or Indian chiefs; others are identified only by number. * *The Vincennes Grants*. These lands in Knox, Sullivan, Daviess, Pike and Gibson counties represent claims or settlements from the U.S. Government or previous French or British administrations that were settled prior to the survey; thus, they were not included. Most of the grant lands were surveyed on a diagonal perpendicular to the Wabash River.

* *The Clark Military Grants.* Land in Clark, Scott and Floyd counties was given to men who served with General George Rogers Clark during the American Revolution. Since the grants had been surveyed earlier, they likewise were not included in the U.S. Rectangular Survey. This land was surveyed on lines perpendicular to the Ohio River.

INDIANA STATE PLANE COORDINATE SURVEY SYSTEM

The State Plane Coordinate System provides an alternate method for identifying tracts of land in Indiana. Established by the Indiana Legislature in 1951, it is modeled after a system suggested by the U.S. Coast and Geodetic Survey (now National Geodetic Survey) and the Council of State Governments.

This survey has several features useful to professional land surveyors. It establishes the location of points on the earth's surface by traversing from points which have been previously identified with considerable accuracy. A location is designated as the intersection of two distance measurements-one in the east-west direction (`x' axis), the other in the north-south direction (`y' axis).

The state is divided into an *east zone* and a *west zone*. These zones are relatively narrow to minimize error from representing the earth's curvature on a flat map. Location of the zones and the `x' and `y' axes are shown in Figure 5.

The counties in the east zone use longitude 85° 40' as the central meridian (`y' axis), and those in the west zone use longitude 87° 05' as the central meridian; both meridians are assigned a value of 500,000 feet. The `x' axis is at latitude 37° 30' in Kentucky, ensuring that all Indiana coordinates will be positive.

Figure 5. The Indiana State Plane Coordinate System. (Note that the east and west ones have different numbering systems on the `x' axis.)

The system is based on hundreds of horizontal control stations on the ground. These coordinates are published and descriptions are available, enabling surveyors to tie their horizontal control surveys to a common horizontal figure-much like vertical control leveling can be tied to a common vertical figure (i.e., sea level). The location of any point surveyed in this system is fixed relative to the stations and may be relocated even if local markers are destroyed.

The Indiana State Plane Coordinate System has gained considerable support since its adoption and has proven a valuable tool. Its coordinates are included on U.S. Geological Survey topographic maps and county soil survey maps.

SUMMARY

When land is sold or purchased, it is wise to obtain another survey of the tract to make sure the boundaries are located accurately. For instance, if farmland acreage is described relative to the U.S. Rectangular Survey, consider having it resurveyed according to the State Plane Coordinate System for confirmation.

Regardless of the system to be used, consult a professional land surveyor who has the qualifications to deal with technical aspects of finding precise points and lines on the land.

For further information on land surveys, their development and uses, see the following:

* McEntyre, J. G. Land Survey Systems, 1978. John Wiley & Sons, Inc, 537 pp.

* Curtis, K. S. The Indiana State Plane Coordinate System, Surveying Publications Series No.2, June 1974. Indiana Society of Professional Land Surveyors, 196 pp.

* Lindsey, A. A. "The Indiana of 1816," p. 10-29. In Lindsey's Natural Features of Indiana, Indiana Academy of Science, 600 pp.

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